

PSYCHE.

THE HABITS OF THE ACULEATE HYMENOPTERA.—IV.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

The species in the genus *Pompilus* Fabr., judging from the records, seem to have a diversity of habits. According to Westwood, *Pompilus niger* Fabr. in England provisions its cells with small Lepidopterous larvae; *Pompilus fumipennis* Zett. with ants, while *Pompilus petiolatus* preys upon spiders. Now no doubt this diversity of habits will be found correlated by structural differences, which should be used in separating this extensive genus into subgenera. In our fauna, most of our species in this genus, or at least those whose habits are known, feed upon spiders.

Mr. D. W. Coquillett has observed in the West *Pompilus tenebrosus* dragging off ♂ different spiders with which to store its cells. Mr. Theo. Pergande tells me he has observed several different species belonging to the genus *Pompilus*, in District of Columbia, Maryland, Virginia and Missouri, carrying off spiders, while I have observed the same thing in Florida.

Family XIV. MASARIDÆ. Nothing positively seems to be known respecting the habits of the few genera and species comprising this family. All our species are rare and occur in the Western States.

Family XV. VESPIDÆ. Packard calls this family "one of the higher families" and includes in it, as sub-families, the Masaridæ and Eumenidæ, placing it near the head of the Aculeata, next to the true bees. Anthophila.

This position I consider very unnatural, as in structure and habits the species comprising it are totally different from the true bees. The pronotum extends back to the tegulae as in the Pompilidæ, Sapygidæ, Thynnidæ, Scoliidæ and Mutillidæ, and they agree with these families in structure, as well as with the fossorial wasps (except the parasite families) in habits. They are strictly predaceous wasps, insectivorous, and have no relation whatever with the true bees.

Vespa and *Polistes* feed their young upon the "chewed up fragments of Lepidopterous and other insects," while the Eumenidæ build mud or clay cells which they fill with dead or paralyzed Lepidopterous and Coleopterous larvae and possibly other insects, just as do the Pompilidæ.

The fact that some of them have three sexes should have no weight against structure and habits, and it should not influence us in assigning the family its natural position, which is, in my opinion, next to the family Pompilidæ.

The exotic species in the genus *Polybia* St. Fargeau are said to enclose their cells by a papery or external covering, but this is not the case with *Polybia cubensis* in Florida. This species builds its papery comb just like *Polistes*, without a covering, attached to the twig of an orange tree.

The habits of the genera *Vespa* and *Polistes* Latr. are probably known to most of us here and I shall not go very particularly or fully into a description of them now.

The *Vespas* as we all know were "The first paper makers," and probably suggested to some of the ancestors of the human race the idea of manufacturing this now absolutely necessary commodity.

In our fauna only three genera with forty-five species are known.

Our most common species in the genus *Vespa* Linn. are *Vespa maculata* Linn., *V. germanica* Fabr. and *V. diabolica* Sauss. The former usually, if not invariably, builds its nest on the limb of some tree, or under some old shed; the two latter in an excavation in the ground or in old stumps; both, however, and in fact all species in this genus, enclose their combs in a globular papery covering. For a full account of these interesting wasps and others consult Walsh, Amer. ent., vol. i, pp. 138-141; Packard's Guide, p. 147; and Marlatt, Proc. ent. soc., vol. ii, p. 80.

The different sexes of all of our species are not known and some of our species may be nothing but the sexes of other species, as seems to have been proved lately in the case of *Vespa*

cuneata and *V. carolina*. The former is known only in the male and neuter sexes; the latter only in the female sex, and all of these were taken last fall from a single nest by Mrs. McKewen, in Virginia.

These, therefore, should be conjoined as one species, under the older name of *V. carolina* Drury.

The parasites of these insects in Europe are *Crypturus argiolus* Gras., *Sphécophaga vesparum* Curtis, *Rhiphorus paradoxus*, Diptera *Anthomyia incanum* and Volucellae, and Stylops, while in America, *Euceras burrus* Cr., *Mesostenus arvalis* and *M. thoracicus* Cr., *Trigonalys bipustulatus* and Stylops have been reared from them.

Family XVII. EUMENIDAE. This is an extensive family and from an economic standpoint of the greatest importance to our farmers and fruit-growers, very few of whom know anything at all of the great benefit they are deriving every year from these brightly marked wasps. They are known as "potter-wasps," from the material used in constructing their cells.

All the species prey upon destructive Lepidopterous and Colcopterous larvae or caterpillars and as the species are very numerous they must destroy many thousands during the year. The caterpillars, after first being paralyzed with their sting, are then stored up in their cells as food for their offspring, from six to a dozen or more being found in each cell.

The species belonging to the genera *Zethus* Fabr. and *Eumenes* Fabr., form globular cells of clay or sand, or sand and

mud mixed, which are attached by a small pedicel to the twig of some shrub or tree. These are filled with larvae, a single egg is placed in each cell and all are hermetically sealed up by a cap of clay. The cell of *Zethus spinipes* Say I have taken most frequently in Florida, attached to the twig of the Iron-tree, while *Eumenes fraterna* Say is usually attached beneath one of the large leaves of the Scrub Palmetto. The latter species, according to Dr. Harris, preys upon the Canker-worm in Massachusetts, but in Florida and elsewhere it also preys on other small caterpillars. I have bred from these cells in Florida *Rhipiphorus dimidiatus*.

In the south, *Monobia quadridens* preys upon large Cut-worms, as I have frequently seen it carrying them into its cells, which were placed in the old burrows of the Carpenter-bee *Xylocopa virginica*, the sides of which it had renovated by a thin veneering of clay and then filled with clay cells from the bottom upwards. More than one wasp was seen going in and coming out of a single burrow and undoubtedly several individuals live and work in harmony together.

It is quite probable that the species in the genus *Odynerus* were originally wood-borers and sand-borers, although now they are less particular in selecting a locality in which to nidificate, the most insecure and oddest places imaginable being often selected by them. Many now also appropriate the galleries and cells made by different bees and wasps, the old mud-dauber's cells being

a favorite locality. A few even construct their cells in an irregular mass of clay and sand surrounding a twig or plant, which on first sight might be easily mistaken for a clump of dried mortar or sand.

All of the *Odyneri* store their cells with Lepidopterous and Coleopterous larvae; and sometimes even with Hymenopterous larvae belonging to the destructive Saw-fly family Tenthredinidae. *Odynerus capra* Sauss. was observed by the Rev. T. W. Fyles to provision its cells with the larvae of the Larch saw-fly *Nematus erichsonii*. Indeed, the service of these insects to the farmer and gardener must be of incalculable value, as they destroy immense numbers of the destructive tineina, geometrina, tortricina, pyralina and noctuina larvae during the season.

In Florida, I have observed *O. errinys* St. Farg. making its nests in the lock of my front door and in old holes in my board fence. I have also reared it many times from cells constructed in old oak-galls *Amphibolips cinerea*. Nine specimens, varying greatly in size, were reared from a single gall. *O. albophaleratus* Sauss. has also been bred from the oak-gall *Amphibolips confluens* Harris, in Massachusetts, while *O. fulvipes* Sauss. was observed by Walsh building its cell in a spool, certainly a queer and insecure place. The habits of many other of our species could be given but these will be left for another paper.

Many of the *Odyneri* are parasitized by species in the family Chrysididae and a few by two or three Ichneumonids.

Linoceras junceus Cr. is the only ichneumonid reared from them in this country.

Family XVII. SAPYGIDAE. All the species in this family, as well as in the three following families—the Tynnidæ, Scoliidæ and Mutillidæ—are without doubt parasitic.

Mr. R. Desvoidy was the first to prove the parasitic habits of *Sapyga*, by breeding the European *Sapyga punctata* from the cells of *Osmia halicicola*; also by his observation on *Sapyga chelostomae* which is parasitic on one of the bees, *Chelostoma* sp.

Palochium repandum Spinola, representing another genus in the family, is parasitic on *Xylocopa violacea*.

Notwithstanding the fact that in our fauna, this family is represented by 2 genera and 22 species, no observations have been published respecting a single species.

In Dr. Riley's collection, now in the National museum, is, however, a single specimen of a *Sapyga* bred at Toronto, Canada, by Mr. W. A. Williams from the cells of *Pelopaeus cementarius*.

Family XVIII. SCOLIIDAE. Very little seems to be known of the habits of the 5 genera and 44 species of these insects found in our fauna.

All reliable observations published show the species are parasitic on various scarabæid larvae and I believe most of the species will be found to attack the larvae of the Coleopterous family Scarabæidæ.

Tiphia inornata Say has been bred by Dr. Riley from *Lachnosterna* larvae,

while, as recorded by Mr. Howard, in *The Standard natural history*, vol. ii. p. 226, "Passerini found the larva of *Scolia flavipes* within the body of the Lamellicorn beetle *Oryctes nasicornis*, and similarly Coquerel states that *Scolia oryctophaga* lives on *Oryctes simia* in Madagascar. Sumichrast supposes that the females of *Scolia azteca* lay their eggs in certain larvae which abound in tan at Tehuacan." In the South I have seen our common *Scolia nobilitata* Fabr. preying upon what I take to be the larvae of a *Diptotaxis*.

Family XIX. THYNNIDAE. This family is closely related structurally to the preceding, and to the Mutillidæ. No species is described from North America, unless we call the brief mention of *Thynnus californicus* (Ent. news, 1892, p. 104), by Wm. H. Patton, a description. The family is well represented in South America, Africa, and Australia, and although there are several hundred described species, up to the present time, the habits of not a single species is known. The family is probably parasitic on bees.

Family XX. MUTILLIDAE. This family is extensively represented in our fauna by 8 genera and over 160 species, many of the genera being characterized from one sex, usually the male, the opposite sex being unknown. It is to be hoped that our students will make an effort to discover the females in those genera now known only in the male sex.

The species are without doubt parasitic in the nests of bees. *Mutilla europæa* is parasitic on *Bombus lapid-*

darius in Europe. In this country, Mr. E. A. Schwarz has bred in Alabama, *Sphaerophthalma saubornii* Blake, in both sexes, from the cells of an Andrenid, *Nomia* sp., while Dr. C. V. Riley has bred *Sphaerophthalma balteola* Blake from the cells of an Anthidium sp. sent him from Florida.

The Ants comprising the families XXI DORYLIDÆ, XXII FORMICIDÆ, XXIII ODONTOMACHIDÆ, XXIV PONERIDÆ, and XXV MYRMICIDÆ, will be treated in a separate paper.

Family XXVII. CHRYSIDIDÆ. This family is represented in our fauna by eleven genera and seventy-seven species. It forms a connecting link, through the family Proctotrypidæ, with the HYMENOPTERA TEREBRANTIA, and the species composing it are among the most brilliant colored of our wasps. Some of the species are said to be "inquilines" or "guest-flies," others true parasites, but I believe all are genuine parasites. Mocsary in his recent great work, "Monographia Chrysididarum orbis terrarum universi" has brought together, in a tabular form, all the records of the rearings of these insects

and it will be only necessary for me here to mention the habits of some of our own species.

Benj. D. Walsh seems to be the only one in North America who has made a record of the rearing of a species in this family. In Amer. ent., vol. 1 (1868), p. 135, he records having bred *Chrysis coerulans* Fabr. var. *bella* Cr. from *Eumenes fraterna* Say.

In treating of the genus *Trypoxylon*, I have already stated having seen *Chrysis verticalis* Pattn. entering the burrows of *Trypoxylon carinifrons* Fox, and this species is undoubtedly parasitic on that wasp. In Florida, I have bred *Chrysis coerulans* Fabr. and *C. perpulchra* Cr. from the cells of *Pelopaacus cementarius* Drury, while from those of *Odynerus quadrisectus* Say issued *Chrysis densa* Cr.

I have now given a *resumé* of the habits of the Aculeate Hymenoptera, arranging the families in what I conceive to be their natural sequence, and as the Chrysididæ terminates the series, my address, already too long, comes to an end.

FURTHER NOTES ON COLEOPTERA FOUND WITH ANTS.

BY HENRY FREDERICK WICKHAM, IOWA CITY, IOWA.

These records are offered as a continuation of the series begun in the last volume of Psyche.* Most of them are new, either as to the beetle or its host and the few others relate chiefly to

doubtful species and are given as additional evidence regarding the true state of affairs. The ants are identified by Mr. Theo. Pergande, whose authority is amply sufficient guaranty as to correctness. Most of the Staphylinidæ are given on the word of Capt. Thos. L.

* Page 321.